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EXPERIENCE OF THE STUDY GROUP OF INDUSTRIAL PRODUCTIVITY, GEPI, AT ESCOLA FLUMINENSE DE ENGENHARIA (THE SCHOOL OF ENGINEERING OF THE STATE OF RIO DE JANEIRO, BRAZIL) IN THE DEVELOPMENT OF PROGRAMS FOR TRAINING OF THE TECHNICIANS OF INDUSTRIAL FIRMS IN METHODS OF ORGANIZATION

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EXPERIENCE OF THE STUDY GROUP OF INDUSTRIAL PRODUCTIVITY (GEPI) AT ESCOLA FLUMINENSE DE ENGENHARIA (The School of Engineering of the State of Rio de Janeiro, Brazil) IN THE DEVELOPMENT OF PROGRAMS FOR TRAINING OF THE TECHNICIANS OF INDUSTRIAL FIRMS IN METHODS OF ORGANIZATION

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I - - What type of agency would be suitable for the development of a drive for a higher productivity?

1. The situation prevailing in Brazil at the present time is featured - insofar as concerns education for technological development - by an acute shortage not only of medium-level engineers and technicians in industry but also, and to an even greater degree, of personnel capable of training existing labor in the methods of organization needed for increased productivity.

2. Here, we describe the main features of the experience gained in three years's activity of the Study Group of Industrial Productivity (GEPI) at Escola Fluminense de Engenharia (The School of Engineering of the State of Rio de Janeiro).

3. The purpose of the GEPI is to carry out effective action aimed at increasing industrial productivity through:

(a). Dissemination of methods for increasing productivity in industry, through articles, talks, films, news-stories in specialized magazines, etc. GEPI has already released some half a dozen articles and presented several dozen talks on this subject;

(b). Advanced training courses in methods of organization for increased productivity, for engineers and technicians working in industry. GEPI has so far held 30 courses (of an average duration of 40 hours each) in which a total of 1 000 trainees have participated;

(c). Technical assistance in the practical application of the methods taught, as a form of follow-up for the ex-pupil during his first actual work. This program also serves to provide examples and case histories for use in future course of the same type. GEPI has applied this method in about twenty firms so far;

(d). Measurement and appraisals of productivity, and studies and research on improvement of productivity and the factors underlying such improvement, with a view to providing better guidance for GEPI's activity. GEPI has not yet been able to implement this sector of the program, due to lack of resources and unavailability of experts.

4. The School's training courses benefit from the closer contact with industrial firms in the neighborhood inasmuch as practical examples can be obtained in local industries, which are already opening their doors to us for student tours and even study periods within industry. The industries are even starting to give

study grants to last-year students in the Industrial Engineering courses, so as to bring them into more intimate contact with their work and provide them with better training. We aim to develop such activities more and more and even make a work period in industry an obligatory feature of the Industrial Engineering Course during at least the last year of study. Heretofore it would not have been easy to do this in view of the lack of contact between the University and the industrial managements, especially those of the small- and the medium-sized firms which are precisely those most needing the technical assistance of a Productivity Center because they often are not in a position to employ an engineer on a full-time basis.

5. With a view to establishing a better tie-in between industry and the management of the Productivity Center, we recommend that such management be in the hands of an administrative board composed of representatives of the University and industry, in equal numbers. We feel it is important to have a representative of the state government. The latter should, of course, be someone in close touch with the industrial and economic activities of the state.

6. Hence GEPI is run by an Administrative Board composed of the following members: the Director of Escola Fluminense de Engenharia; the Coordinator of GEPI; the Professor of Economics and Organization of the Escola Fluminense; one representative of the Federation of Industries of the State of Rio de Janeiro; one representative of the government of State of Rio de Janeiro; one representative of the companies participating in GEPI's activities.

7. The Administrative Board studies and decides on matters of major importance brought to its knowledge by the Coordinator. The latter acts as Executive Director inasmuch as he is in charge of all work necessary for the technical and administrative operations of GEPI. He is assisted by a permanent team consisting of a secretary, a typist and two engineers, who follow up the courses given and do some practical work in the industrial firms. Records of the latter work are written up and used as "case histories" in the courses. Brazilian and foreign professors and industrial technicians are also invited to give the specialized courses.

8. Another advantage derived from the Board resides in the assurance provided that the activity of the Productivity Center will be of a practical type, avoiding any possible theorical and academic tendencies on the part of university professors. As a matter of fact, it should be stressed that few universities in Brazil would be in a position to embark right away on a program of courses, seminars and technical assistance to industrial firms, in view of the shortage of instructors familiar with modern methods of industrial organization and the aggressive techniques used in giving courses for industrial management, often attended by men of mature age, who have lost the habit of attending courses. In chapter V we give a suggestion on proper training for instructors.

9. The basic Set-Up of a Productivity Center: The action of a Productivity Center should commence with the Dissemination of basic notions regarding Productivity and how to increase it, as well as the methods most used, in organising and managing industrial firms. This is done through articles in the press and in specialized magazines and talks before professional associations and in companies Whenever possible, special training films are shown.

10. Once a few industrialists are convinced of the need for finding a solution to problems of application of the methods envisaged, it is then necessary to proceed to the phase of Training company administrators and technicians in the methods in question. This training is done in practical courses and represents the major activity of a Productivity Center. It has a "multiplying" effect in view of the fact that one instructor can usually transmit information to a group of 20 to 40 participants.

11. As a sequence to these courses, it is of fundamental importance that the industrialists be induced to apply the methods presented, even though on an elementary basis. This calls for Technical Assistance, which consists of following up the participants in the course so as to encourage them and perhaps even

aid them in implementing in their plants the methods taught. This phase is the crowning result of the Productivity Center's action. Unfortunately, it can be carried out only in a somewhat restricted manner. If it were our purpose to extend it, the Productivity Center would become transformed into an overall office for the organization of industrial firms, which is not, of course, appropriate.

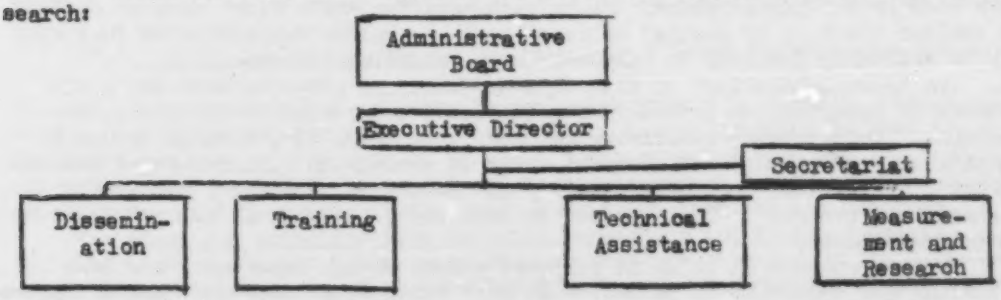
12. Finally, after a certain period of operation and after winning the confidence of a certain number of local industrialists and being able to rely on information requested of them, we can enter into another fundamental aspect of a Productivity Center, namely, Measurement of productivity and comparisons with other firms in the same sector, and hence Research into the causes of such instances of low productivity as are observed in the firms in question. This makes it possible to continue the action of the Productivity Center in a rational manner, extending it to other firms not yet served. This is done in every case through the above-mentioned phases of dissemination, training and technical assistance.

13. It would, of course, be an ideal state of affairs if this work could start with a broad fact-finding survey, to measure Productivity and look into the causes of deficiensfes encountered. However, our experience in this respect has shown that it is impossible to commence the activity of a Productivity Center by calling upon industrialists to open up their firms and cooperate by supplying the necessary information. The reason for this is that such industrialists know nothing about the persons in charge of such a newly-introduced Productivity Center. After a few years of contact, through efficient efforts on the part of the Center, this state of affairs will no longer prevail.

14. An exception to the above remarks would be the case in which the Productivity Center is supported by a government agency of obvious prestige or when the industrial firms obtain certain advantages from participating in the activity of the Productivity Center. As a matter of fact, some countries in Western Europe have issued decrees and instructions favoring efforts aimed at increased Industrial Productivity, whereby special credits, exemption from certain taxes, etc., are granted to firms adopting the measures recommended by official Productivity agencies. Other forms of action are the offering of salary bonuses, the establishment of organisation services, etc.

15. Although the adoption of such general measures on the part of the government is of the greatest importance, it would seem to us that they ought to be preceded by a small-scale action on the part of regional Productivity Centers, in order to train a few national technicians who may then— thanks to the experience they have acquired— be able to direct action on a broader basis, under government sponsorship. If this broader action were to be commenceddirectly it would be necessary to resort to the use of foreign experts, due to lack of local know-how. The success of such an undertaking would be somewhat doubtful, as the probable reaction on the part of industrialists in the region would be unknown.

16. Finally, we present a simple type of organisational chart for a Productivity Center, reflecting the four main sectors of activity discussed above, namely: dissemination, training, technical assistance, and measurement and research:



II- - Type of action that is recommended

17. It is of fundamental importance that the activity of the Productivity Center be of an eminently practical nature, right from the initial phase of dissemination. That phase, incidentally, is the most important of all, because the confidence of the industrialists will be won or lost at the outset dependent upon how effectively or otherwise it is done. A drive which begins with talks and full-length articles of substance, but which does not take into consideration the numerous day-to-day problems of a company administrator, will fail to attract attention. Such a campaign would be fated to become a mere movement by intellectuals and would not reach the medium-sized and small firms which are the main targets of Productivity campaigns (inasmuch as large companies often have their own special departments dealing with methods of organization).
18. The campaign should be disseminated in simple, readily understandable terms, preferably using examples from local factories and employing slides and films to point out practical results already obtained.
19. In the training courses it is even more important to maintain this practical aspect, by abundant use of audio-visual means such as films, tests with "urns" and "dice", small-scale models of building lay-outs, slides, etc., as described in a paper by the author presented to this Conferences under the title "Audio-Visual Aids used for training Industrial People in Organization for Productivity Increase".
20. In providing technical assistance to industrialists it is important that the Productivity Center specialist assist them in solving practical problems so as to provide easy, immediate results rather than guiding them towards the solution of more important complex problems harder to solve, which might lead them to abandon the proposed course of study.
21. Selection of the technicians capable of carrying forward the campaigns of the Productivity Center thus become a somewhat delicate problem. Besides having sound basic university training, which is often acquired along academic lines, it is essential that such personnel have a pragmatic and "short-range" approach aimed at the rapid obtaining of palpable results supporting the operations of the Productivity Center. The management of the Center must thus operate along almost commercial lines, endeavoring to convince and satisfy its "clientèle", namely, company management. Only thus will the Productivity Center justify its existence and be assured of continuing operation, thanks to the contributions made by the industrialists. It can readily be understood how hard it is to find persons of real ability, having both the theorical knowledge needed and at the same time a practical turn of mind and a—so to say— commercial concern with having the Productivity Center be able to make its way without official subsidies. This, we repeat, is the acid test of its true usefulness.
22. Our experience with the GEPI shows that a good way to get instructors is to hire young engineers who have had a few years' experience in industrial firms (so that they have not yet reached management positions which would make it hard for them to be reassigned). Such engineers should be given a few month's training in practical courses and work assignments after which they will be in a position to give short (or "introductory") courses and direct the practical work done by the participants. It is important for their first work to be done in smaller towns or in special courses aimed at smaller companies, so that they may be gradually prepared to take over more demanding duties.
23. The "ground-breaking" or disseminatory lectures given by GEPI cover the methods of organization necessary for increased industrial Productivity. For instance, "Industrial Productivity and how to increase it","Simplification of industrial work", "Time and movement study in connection with increased Productivity","Statistical control of quality and avoidance of waste", "Production planning and control", "Training within industry", "Industrial safety" might be suitable subjects.
24. We have endeavored to avoid subjects which, though important, are less technical and objective in nature, such as: human relations, the task of leader-

ship, principles of company management administrative science, etc. Other basic points connected with specialized training of labor and firemen have also not been covered because such subjects are already handled in Brazil by a very well equipped agency, the SENAI (National Industrial Apprenticeship Service).

25. We mention beneath the main courses that have already been given a number of times by GEPI:

(a). Industrial Productivity. 20 hours;
(b). Introduction to Company Management. 20 hours. Course covers main problems in the following sectors: personnel, marketing, finance and accounting, materials and purchases;
(c). Work-simplification: 40 hours;
(d). Time study. 30 hours;
(e). Cost accounting. 30 hours.

III - Results achieved by GEPI

26. The participants in the courses receive a certificate provided they meet the following requirements: 80% attendance; passing of a final examination; presentation of a report on applications of methods of simplification techniques in their own companies. Dozens of instances of improvement have already been obtained, with increases in productivity by a worker or by a machine often to the extent of 100 to 200% and substantial increases in annual profit up to as high as US$10,000 in certain cases. In a special film and a series of articles prepared by the GEPI a number of these improvements carried out by Industrialists taking the courses are actually shown. In view of the fact that these are simple problems which can be cleared up in about a week, it can readily be understood how important an agency spurring the work of a Productivity Center can be from the point of view of economic development.

27. It should be mentioned that the "Industrial Productivity" course given by GEPI appears to be the most suitable means for starting a regional campaign, in view of the simplicity and universality of the subjects dealt with. It furthermore introduces in a methodical manner a number of basic concepts of industrial life: The general organization of the company and simplification of its operations; decisions based on the theory of statistical inferences (the Ratio Delay method along with statistical control of quality). Such a course thus opens the mind up for other courses which may perhaps be even more useful to the economy of the underdeveloped countries, especially those whose goal is primarily increased productivity by capital (economic and financial analysis of companies, industrial accountancy, etc.).

28. In the underdeveloped areas, where under-employment is the rule, courses teaching methods for increasing productivity of labor (such as those on Time and Movement Study) must be used in moderation and accompanied by a series of measures for lessening the disadvantages which might arise from possible releasing of labor, such as an undertaking on the part of the industrialists to utilize such labor for expansion of the firm, and so on. In view of the briefness of this report, we shall not go into the need for overall economic planning including the integration of plans for increased productivity and their consequences, such as the releasing of labor, etc. It might be added that GEPI's pilot-work as described is quite limited and will by no means change the existing economic and social set up in the region in which it operates.

IV - I Congresso Fluminense de Produtividade (First Productivity Congress of the State of Rio de Janeiro)

29. As a result of GEPI's activity in the state of Rio de Janeiro, industrialists in the city of Petropolis proposed that a Productivity Congress be held there. The first congress of its type in Brazil, it was attended by about 100 technicians and industrialists. They discussed and approved several dozen recommendations which appear in the "Annals of the First Fluminense Productivity Congress."

V - Plans for spreading this activity throughout the whole of Brazil

30. The above-mentioned Congress on Productivity was attended by the Directors of the eleven Productivity Centers established by the Federations of Industries

of the States, which are in turn coordinated by the National Center for Productivity in Industry (CENPI), an agency of the National Confederation of Industry. At the congress there was a discussion of the plans of action for 1962, but it was found impossible to get them implemented. We shall nevertheless summarize the main steps we feel necessary for the development of a campaign for increased Productivity throughout the whole of Brazil:

(a). Establishment of a pilot-agency to carry out limited regional action, with a view to: training a few technicians, checking the reaction on the part of the industrialists, preparing and trying out the necessary teaching materials: texts, audio-visual materials, etc. (This stage has already been carried out in Brazil with the establishment of GEPI in 1959. Effective assistance was obtained in this respect from the French Technical Cooperation Service, which sent five missions of experts to give courses);

(b). Formation of an Advisory Council to organize and coordinate official support for the establishment of autonomous Regional Productivity Centers. As already mentioned, we feel this Council ought to operate out of the Ministry of Education and that the Productivity Centers ought to be located in the local Universities;

(c). Holding of an intensive one-month course at the pilot-agency, in order to train TWI instructors and Executive Directors for the Productivity Centers to be established in the Universities interested in participating in the program;

(d). Organization of a one-week Seminar in each Productivity Center in course of organization, to be given by a technician of the pilot-agency, so as to have some discussion with the local faculty and industrialists on how to organize and run the Center. This will facilitate the task of the Executive Director. At the same time the future instructors and technicians for the Center could be selected for training in intensive courses in the pilot-agency. (Such courses should already have been planned by this time, in order to permit detailed discussion of the program and goals intended);

(e). The Productivity Centers would commence their action with TWI courses, given within a small group of companies, so as to provide an effective follow-up which would make it possible after 6 or 12 months to appraise the overall improvements obtained at the company level as a result of this action;

(f). Organization within the pilot-agency of six intensive courses lasting one-month each for training instructors in the principal methods to be made known at the outset by the Productivity Centers: organization of production; commercial organization; financial administration and accounting; personnel problems, etc. Each Productivity Center would send:

(i). An experienced technician to follow each of the courses and prepare to hold talks and seminars on his return, thus ensuring short-term action. It is of interest that such technician be a member of the University faculty so that his future courses may also derive benefit from this action.

To hold these courses the pilot-agency would have to avail of both Brazilian and foreign experts. Private Brazilian consultants would thus enter into contact with professors and technicians from the States, thus making it easier to hold courses there later on, and to cooperate with the action on the Productivity Centers.

(ii). A few young engineers or economists should then establish coordinated action so as to create a broad course on company administration. Participants would then have six months of practical work after which they would return under contract to their Productivity Centers qualified to hold courses and provide technical assistance on a long-range basis, with preparation through TWI courses, talks and seminars already held in the region. Some of these young specialists might also be selected to undergo finishing courses under study grants abroad.

31. In the chart below we show the main activity to be carried out in the

Center (headquarters of the pilot-agency and Advisory Council) and in the States or Regions, during the four-year period felt necessary for the establishment of the Productivity Centers on an autonomous basis i.e., with technicians of their own. About the middle of the fourth year of operation of this plan, a National Productivity Congress would be held, experience gained would be discussed and the foundation laid for continuity of action.

32. The above summarizes the main lines of approach we feel necessary for the development of a Productivity Campaign in Brazil. This outline might also be used as a basis for a discussion on how to carry out such a plan in countries in course of development, featured by a shortage of engineers and technicians and by geographical size, an obstacle to centralized activity.

LOCATION / TIME PERIOD	IN STATES OR REGIONS	AT CENTER (headquarters of pilot-agency and Advisory Council)
FIRST YEAR		Formation of Advisory Council Preparation of general directives for action.
	Commencement of discussions between instructors, technicians and industrialists at Productivity Center. Holding of one-week seminars for setting up of Productivity Centers.	Consultation with Universities Preparation and holding of intensive courses for Executive Directors of Productivity Centers and instructors for TWI.
SECOND YEAR	Commencement of TWI courses with follow-up.	Hiring of technicians and preparation of materials necessary for holding six intensive courses planned.
	Commencement of talks and seminars by local instructors and technicians who took the one-month course and with...	Holding of the courses in question.
THIRD YEAR	...possible cooperation by private advisory personnel with whom they have established contact during the courses taken.	Commencement of practical work so as to complete training of future technicians of Productivity Centers.
	Commencement of local action by technicians trained during a period of twelve months, at the pilot agency.	Preparation for National Productivity Congress starts.
FOURTH YEAR	Preparation of material for the Congress.	Congress held
	Discussion on conclusions of Congress and preparation for greater expansion of regional activity.	Printing of Annals and preparation of new program to provide continuity of action.

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